

WHAT IS CLAIMED IS:

1. A method for fabricating a semiconductor film comprising:

irradiating a semiconductor film formed over a substrate with a laser beam to

5 crystallize the semiconductor film,

wherein ultrasonic vibration is applied to the substrate during irradiating the

laser beam while holding an end portion of the substrate.

2. A method for fabricating a semiconductor film according to claim 1,

10 wherein said laser beam is a YVO₄, a YAG, a YLF or an excimer laser.

3. A method for fabricating a semiconductor film comprising:

holding a substrate over a stage having pores wherein said substrate is provided

with a semiconductor film;

15 spouting gases from the pores to float the substrate; and

irradiating a semiconductor film formed over the substrate with a laser beam

while holding an end portion of the substrate,

wherein during irradiating the laser beam, ultrasonic vibration is applied to the

substrate.

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4. A method for fabricating a semiconductor film according to claim 3,

wherein said laser beam is a YVO₄, a YAG, a YLF or an excimer laser.

5. A method for fabricating a semiconductor device comprising:

forming a semiconductor film having an amorphous structure over a substrate;
and

irradiating the semiconductor film with a laser beam while applying ultrasonic vibration to the substrate to crystallize the semiconductor film.

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6. A method for fabricating a semiconductor device according to claim 5,
wherein said laser beam is a YVO_4 , a YAG, a YLF or an excimer laser.

7. A method for fabricating a semiconductor device according to claim 5,
10 wherein said semiconductor device is used for a display device selected from the group consisting of a video camera, a digital camera, a goggle-type display, a navigation system, a sound reproduction device, a lap-top personal computer, a game machine, a portable information terminal, and an image reproduction device.

15 8. A method for fabricating a semiconductor device comprising:
forming a semiconductor film having an amorphous structure over a substrate;
and

irradiating the semiconductor film with a laser beam condensed into a linear shape in an oxygen atmosphere while floating the substrate and applying ultrasonic
20 vibration to the substrate to crystallize the semiconductor film.

9. A method for fabricating a semiconductor device according to claim 8,
wherein said laser beam is a YVO_4 , a YAG, a YLF or an excimer laser.

10. A method for fabricating a semiconductor device according to claim 8,
wherein said semiconductor device is used for a display device selected from
the group consisting of a video camera, a digital camera, a goggle-type display, a
navigation system, a sound reproduction device, a lap-top personal computer, a game
5 machine, a portable information terminal, and an image reproduction device.

11. A method for fabricating a semiconductor device comprising:
forming a semiconductor film having an amorphous structure over a substrate;
irradiating the semiconductor film with a laser beam condensed into a linear
10 shape while applying ultrasonic vibration to the substrate to crystallize the
semiconductor film; and
crystallizing a whole surface of the semiconductor film while overlapping a
beam spot of the laser beam on the film.

12. A method for fabricating a semiconductor device according to claim 11,
15 wherein said laser beam is a YVO_4 , a YAG, a YLF or an excimer laser.

13. A method for fabricating a semiconductor device according to claim 11,
wherein said semiconductor device is used for a display device selected from
20 the group consisting of a video camera, a digital camera, a goggle-type display, a
navigation system, a sound reproduction device, a lap-top personal computer, a game
machine, a portable information terminal, and an image reproduction device.

14. A method for fabricating a semiconductor device comprising:

forming a semiconductor film having an amorphous structure over a substrate;
crystallizing the semiconductor film having an amorphous structure by adding
a metal element or a metal compound having catalytic action for enhancing a
crystallization of the semiconductor film and by heat-treating; and

5 irradiating the semiconductor film with a laser beam condensed into a linear
shape while floating the substrate and applying ultrasonic vibration to the substrate in
order to improve a crystallinity of the semiconductor film.

10 15. A method for fabricating a semiconductor device according to claim 14,
wherein said laser beam is a YVO₄, a YAG, a YLF or an excimer laser.

15 16. A method for fabricating a semiconductor device according to claim 14,
wherein said semiconductor device is used for a display device selected from
the group consisting of a video camera, a digital camera, a goggle-type display, a
navigation system, a sound reproduction device, a lap-top personal computer, a game
machine, a portable information terminal, and an image reproduction device.

20 17. A method for fabricating a semiconductor device according to claim 14,
wherein said metal element is nickel or platinum.

18. A method for fabricating a semiconductor device comprising:
forming a semiconductor film having an amorphous structure over a substrate;
crystallizing the semiconductor film having the amorphous structure by adding
a metal element or a metal compound having catalytic action for enhancing a

crystallization of the semiconductor film and by heat-treating;

irradiating the semiconductor film with a laser beam condensed into a linear beam while applying ultrasonic vibration to the substrate in order to improve a crystallinity of the semiconductor film; and

5 improving a crystallinity of the semiconductor film while overlapping a beam spot of the laser beam on the film.

19. A method for fabricating a semiconductor device according to claim 18, wherein said laser beam is a YVO₄, a YAG, a YLF or an excimer laser.

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20. A method for fabricating a semiconductor device according to claim 18,

wherein said semiconductor device is used for a display device selected from the group consisting of a video camera, a digital camera, a goggle-type display, a navigation system, a sound reproduction device, a lap-top personal computer, a game machine, a portable information terminal, and an image reproduction device.

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21. A method for fabricating a semiconductor device according to claim 18, wherein said metal element is nickel or platinum.

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22. A laser processing apparatus comprising:

a means for floating and transporting a substrate in a horizontal direction;

an optical system for condensing a laser beam into a linear shape or a rectangular shape; and

a means for applying ultrasonic vibration to the substrate.

23. A laser processing apparatus according to claim 22,
wherein said laser beam is a YVO₄ , a YAG, a YLF or an excimer laser.

5 24. A laser processing apparatus comprising:

 a means for transporting a substrate in a horizontal direction by a means for
holding its end portion and moving in one direction and a means for floating the
substrate;

 an optical system for condensing and irradiating the semiconductor film with a
10 laser beam to the substrate; and

 a means for applying ultrasonic vibration to the substrate from a region for
holding the substrate.

 25. A laser processing apparatus according to claim 24,
15 wherein said laser beam is a YVO₄ , a YAG, a YLF or an excimer laser.

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